North Coast Watershed Assessment Program

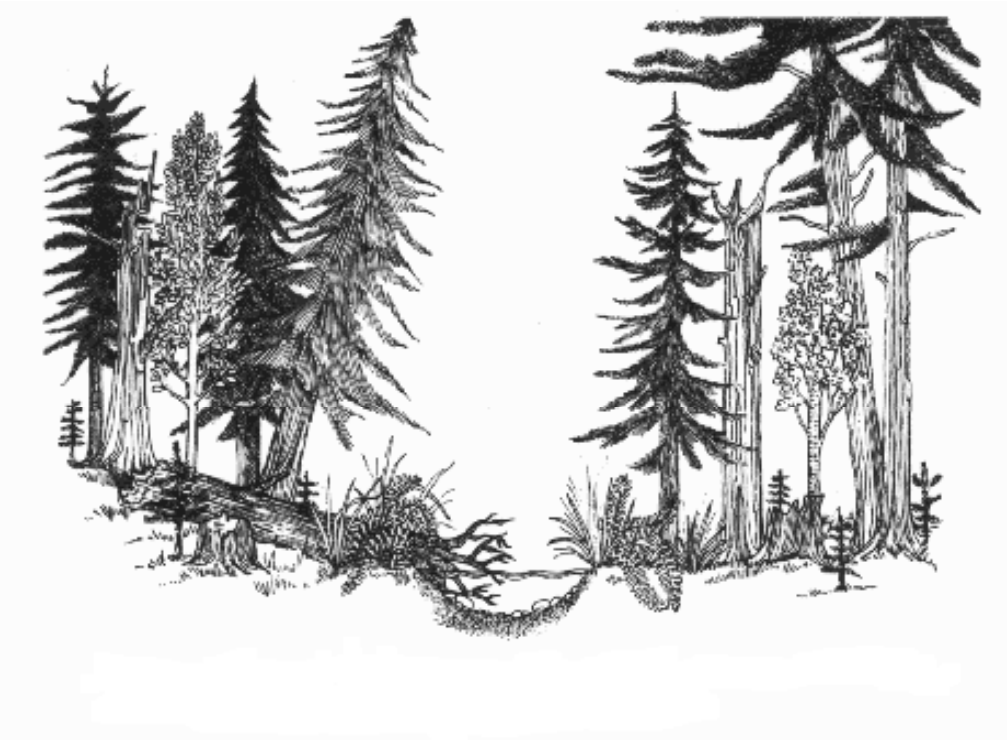
DRAFT

Mattole Watershed Synthesis Report

The mission of the North Coast Watershed Assessment Program is to conserve and improve California's north coast anadromous salmonid populations by conducting, in cooperation with public and private landowners, systematic multi-scale assessments of watershed conditions to determine factors affecting salmonid production and recommend measures for watershed improvements.

Public Review Draft - March 22, 2002

Southern Mattole Subbasin

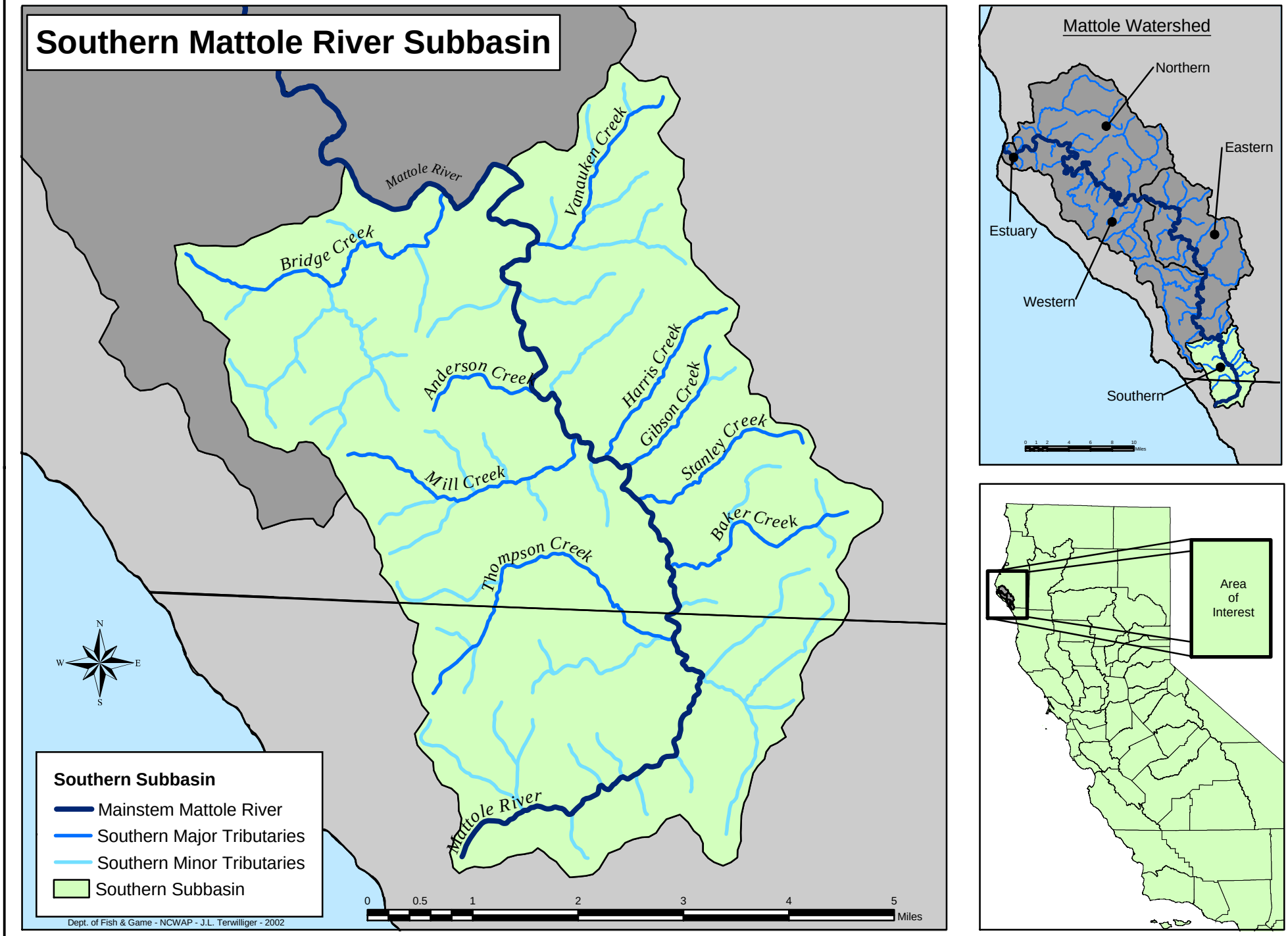


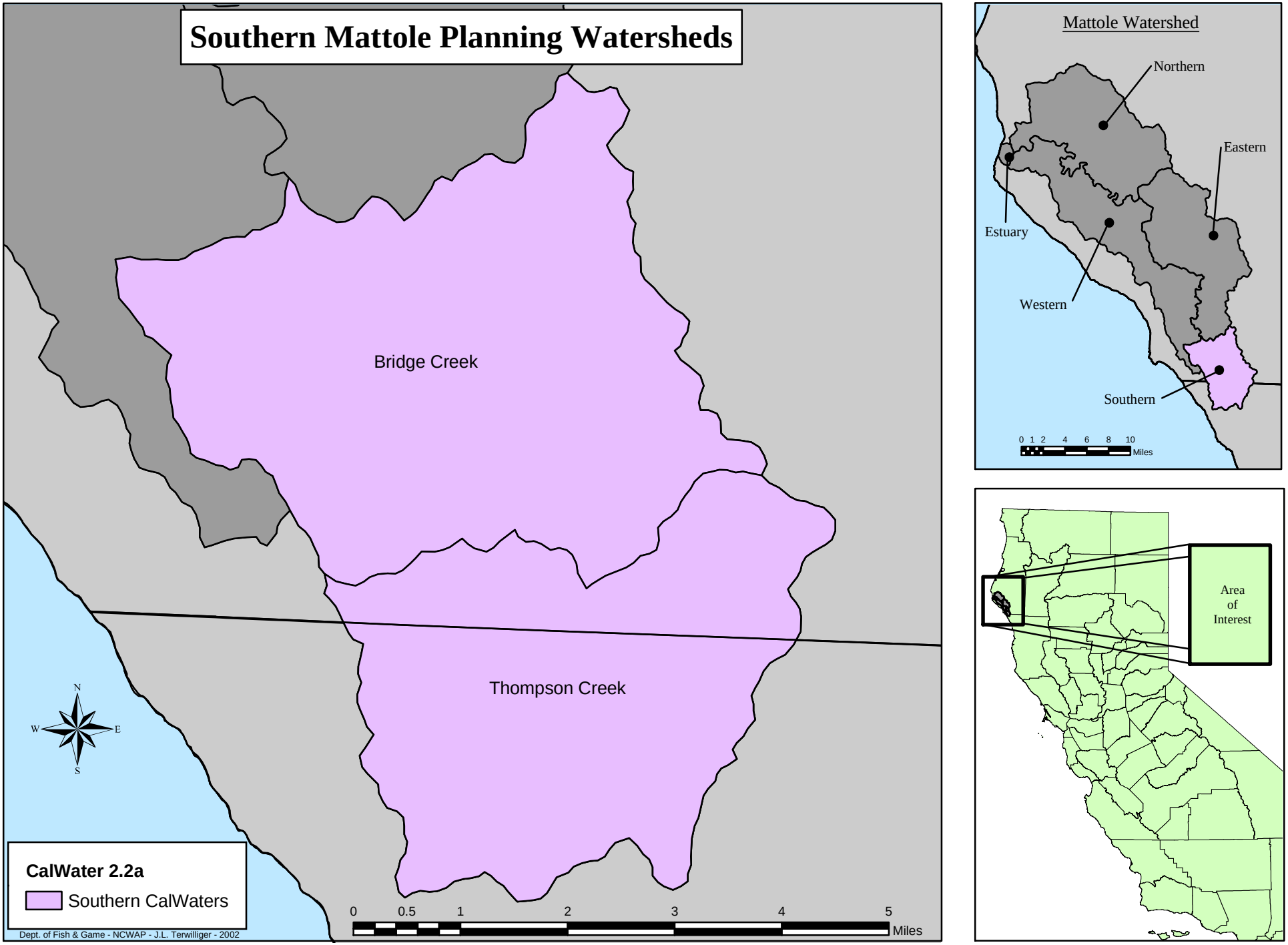
Introduction

The Southern subbasin is located south of Bridge Creek (River Mile 52.1) and McKee Creek (River Mile 52.8), both near Thorn Junction, and continues upstream to the Mattole's headwaters near Four Corners (River Mile 61.5), a distance along the Mattole mainstem of about 9.4 river miles (see map on following page). There are twenty-seven perennial streams that drain a watershed area of 28 square miles. The DFG has recently surveyed 21.9 miles of the subbasin's anadromous reaches. Elevations range from 930 feet at Bridge Creek to approximately 1,500 feet in the headwaters of the tributaries.

Climate

The Southern subbasin temperature and precipitation totals are influenced by the King Range immediately west of the area. Temperatures reflect the inland location ranging from sub-freezing to above 100° F but generally stay between 55° and 85° F. Rainfall totals average between 70 and 85 inches.


Southern Mattole River Subbasin
Mattole River
Vanauken Creek
Bridge Creek
Anderson Creek
Harris Creek
Gibson Creek
Stanley Creek
Mill Creek
Baker Creek
Thompson Creek
Mattole River
N
W
E
S
Southern Subbasin
Mainstem Mattole River
Southern Major Tributaries
Southern Minor Tributaries
Southern Subbasin
0 0.5 1 2 3 4 5
Miles
Dept. of Fish & Game - NCWAP - J.L. Terwilliger - 2002
Mattole Watershed
Northern
Eastern
Estuary
Western
Southern
Area of Interest


Southern Mattole Planning Watersheds
Bridge Creek
Thompson Creek
N
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CalWater 2.2a
Southern CalWaters
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Miles
Dept. of Fish & Game - NCWAP - J.L. Terwilliger - 2002
Mattole Watershed
Northern
Eastern
Estuary
Western
Southern
0 1 2 4 6 8 10
Miles
Area
of
Interest

Hydrology

The Southern subbasin is made up of two complete Calwater Units (map on previous page). There are 23.5 perennial stream miles in 27 perennial tributaries in this subbasin (Table 28). Twelve of these tributaries have been inventoried by the DFG. There were 16 reaches, totaling 19.5 miles in the inventory surveys. The inventories included channel and habitat typing, and biological sampling.

Table 28: Surveyed Streams with Estimated Anadromy in the Southern Subbasin.

Stream	DFG Survey (Y/N)	DFG Survey Length (miles)	Estimated Anadromous Habitat Length (miles)	Reach	Channel Type
Bridge Creek	Y		2.8		
	Y	3.1			
	Y	0.7		1	F4
	Y	0.5		2	
	Y	1.9		3	F4
Robinson Creek	N		1.5		
West Branch Robinson Creek	N		1.0		
Vanauken Creek	Y		1.1		
	Y	1.4		1	F4
	Y	0.1		2	G4
South Fork Vanauken Creek	Y	0.1			
Anderson Creek	Y	0.9	0.1	1	B3
Ravasoni Creek	N		0.0		
Upper Mill Creek	Y	0.2	2.3	1	F4
Harris Creek	N		0.8		
Gibson Creek	N		1.0		
Upper Mattole River	N		7.0	1	F3
Stanley Creek	Y	1.0	1.0	1	F4
Baker Creek	Y	2.2	1.7	1	F4
Thompson Creek	Y		3.2		
	Y	1.6		1	B1
	Y	1.7		2	F1
Yew Creek	Y	0.7	1.3	1	B4
Helen Barnum Creek	Y	0.9	0.6	1	E4
Lost Man Creek	Y	1.2	0.5	1	E4
Unnamed Tributary to Lost Man Creek	Y	1.2		1	E4
Big Alder Creek	N				
Pipe Creek	N				
Dream Stream	N				
Arcanum Creek	N				
Big Jackson Creek	N				
Phillips Creek	N		0.1		
McNasty Creek	N		1.0		
Ancestor Creek	N		0.3		

In their inventory surveys, the DFG crews utilize a channel classification system developed by David Rosgen (1994) and described in the *California Salmonid Stream Habitat Restoration Manual* (Flosi, et al., 1998). Rosgen channel typing describes relatively long stream reaches using eight channel features: channel width, depth, velocity, discharge, channel slope, roughness of channel materials, sediment load and sediment size. There are eight general channel types in the Rosgen classification system.

In the Southern subbasin, there were three type B channels, totaling 3.2 miles; three type E channels, totaling 3.3 miles; eight type F channels, totaling 7.4 miles; and one type G channel, totaling 0.1 miles.

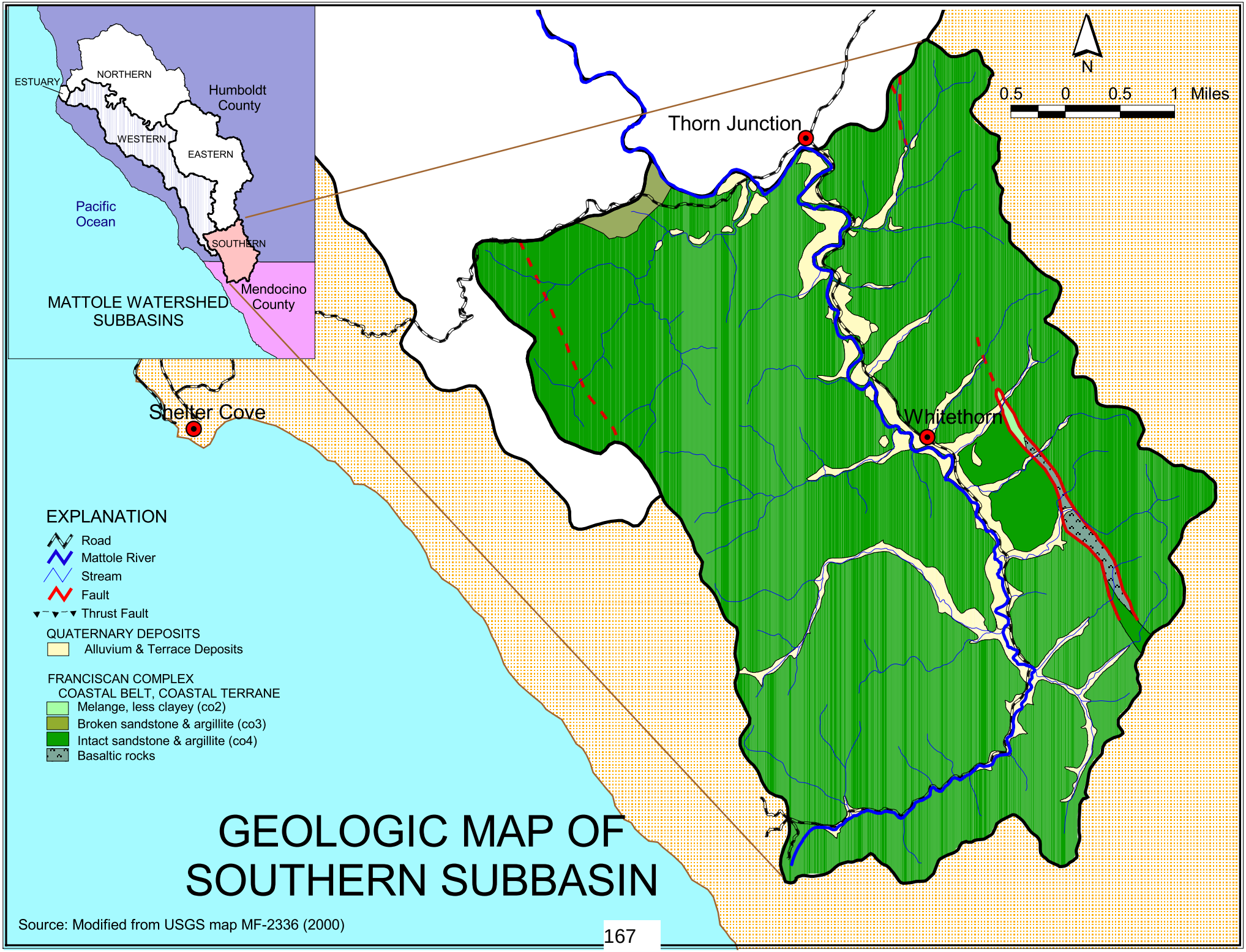
Type B stream reaches are wide, shallow, single thread channels. They are moderately entrenched, moderate to steep gradient reaches, which are riffle-dominated with step/pool sequences. Type B reaches flow through broader valleys than type A reaches, do not have well-developed floodplains, and have few meanders. Type E stream reaches are narrow, deep, single thread channels. They are slightly entrenched, low gradient reaches with consistent riffle/pool sequences. Type E reaches flow through wide alluvial valleys and have frequent meanders. Type F stream reaches are wide, shallow, single thread channels. They are deeply entrenched, low gradient reaches and often have high rates of bank erosion. Type F reaches flow through low-relief valleys and gorges, are typically working to create new floodplains, and have frequent meanders. Type G or gully stream reaches are similar to F types but are narrow and deep. With few exceptions, type G reach types possess high rates of bank erosion as they try to widen into a type F channel. Type G reach types are found in a variety of landforms, including meadows, developed areas, and newly established channels within relic channels (Flosi, et al., 1998).

Geology

The geology of the Southern subbasin is the most uniform and stable in the Mattole basin. The subbasin is underlain by Franciscan Coastal terrane rocks that are generally less broken and, therefore, more resistant to erosion and slope instability in comparison to bedrock in the other subbasins. Overall relief is the lowest of the subbasins; however, the relatively stable condition of the bedrock has led to the formation of predominantly hard terrain, steep, sharp-crested topography dissected by more straight, well-incised sidehill drainages with steep, heavily forested slopes. . The terrain distribution for the entire Mattole Watershed is presented on maps within the *Mattole Watershed Profile – Geology* section of this report.

In the lower reaches of the larger tributaries and along the main stream of the Mattole, the active streams become confined to narrow channels incised within broader valley bottoms that where formed as bedrock strath terraces with a thin mantle of alluvium. Drainage orientations generally follow, or are perpendicular to, the dominant northwest-trending structural fabric of the bedrock in the area. The more intact condition of the bedrock is reflected in the presence of comparatively few deep-seated landslides in the Southern subbasin. The larger dormant landslides that have been obseved from aerial photographs are widely scattered throughout the subbasin. Most of the active mass wasting activity appears to be in the form of debris slides, and the majority of these are observed adjacent to streams, or in association with roads. Debris slide slopes are extensive throughout the steep hard terrain. The landslide occurrence on the three terrains is presented on maps within the *Mattole Watershed Profile – Geology* section of this report.

Portions of the subbasin underlain by active landslides are interpreted as having a very high landslide potential. Areas underlain by moderate slopes out side the debris slide slopes are generally mapped as moderate with smaller areas of high landslide potential.



GEOLOGIC MAP OF SOUTHERN SUBBASIN

Source: Modified from USGS map MF-2336 (2000)

Vegetation

Unless otherwise noted, the vegetation description in this section is based on manipulation of Calveg 2000 data. This is vegetation data interpreted from satellite imagery by the United States Forest Service, Remote Sensing Lab. The minimum mapping size is 2.5 acres.

Mixed hardwood and conifer forests cover 70% of the area, conifer forest 4%, and hardwood forest 23% for a total of ninty-five percent forested area. Approximately 13% of the area contains a redwood component along the lower elevations near watercourses. Grassland occupies 4% of the subbasin. Shrub, barren, agricultural lands, and urban classifications together cover the less than 1% of the area. The forested vegetation reflects the impacts of harvesting. 63% of the Southern subbasin is in the 12 to 23.9 inch diameter breast height (dbh) size class. 22% is in a diameter size class greater than 24 inches diameter breast height.

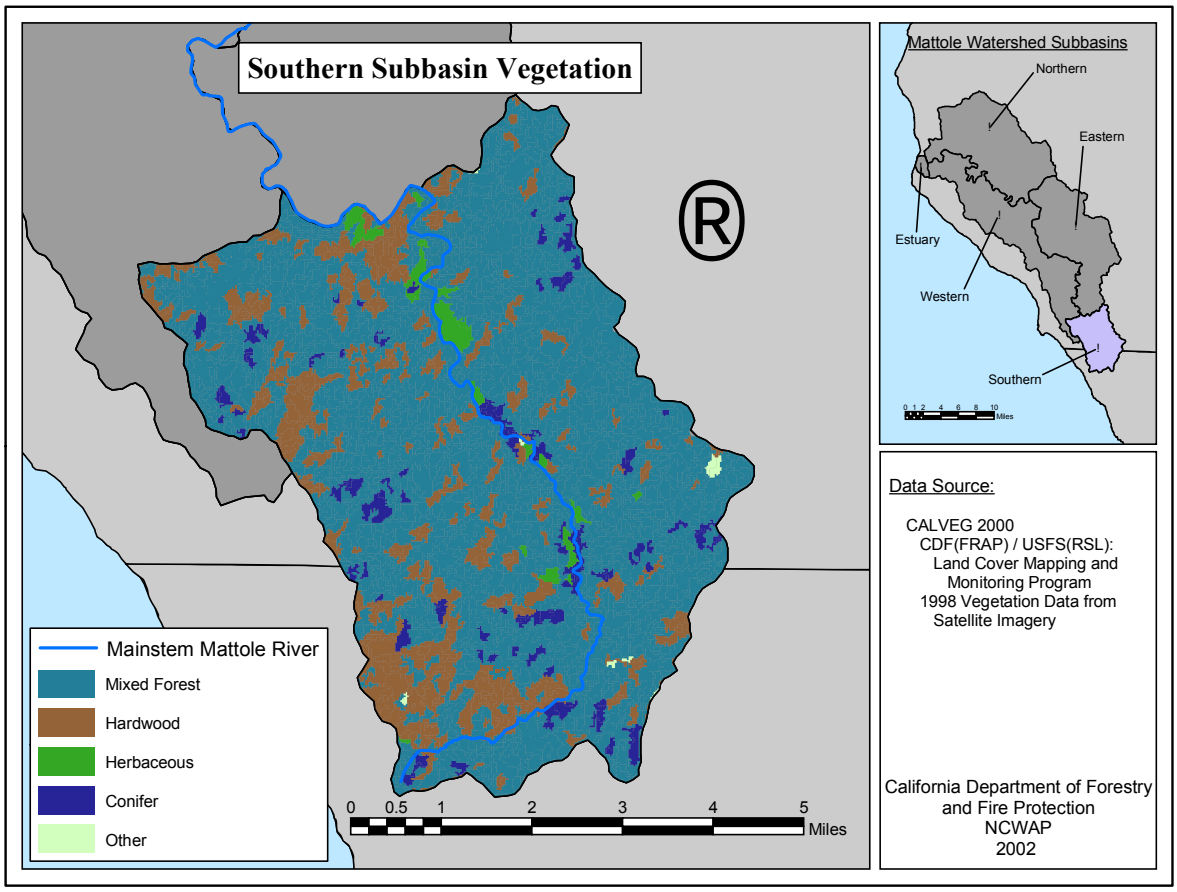


Figure 39: Vegetation of the Southern Subbasin.

Land Use

The watershed is largely subdivided into small parcels and is the most densely populated planning basin of the Mattole (Figure 40). The town of Whitethorn is located at the middle of this subbasin near the confluence of Upper Mill Creek and the Mattole River. The human population has contributed to reduced summer flows in some of the tributaries and the mainstem itself above Baker Creek due to domestic and agricultural water consumption. About half of the watershed is managed for timber production (Figure 41, Figure 42, and Table 29) and is unique to the Mattole as a redwood production zone. Controversy over timber harvest issues have occurred in the past, focused on stands near what is now the 4,700 acre Sanctuary Forest, but today much of the land in contention has been sold or traded into public ownership as ecological reserves. There is interest from some local citizens to expand the size of the reserves.

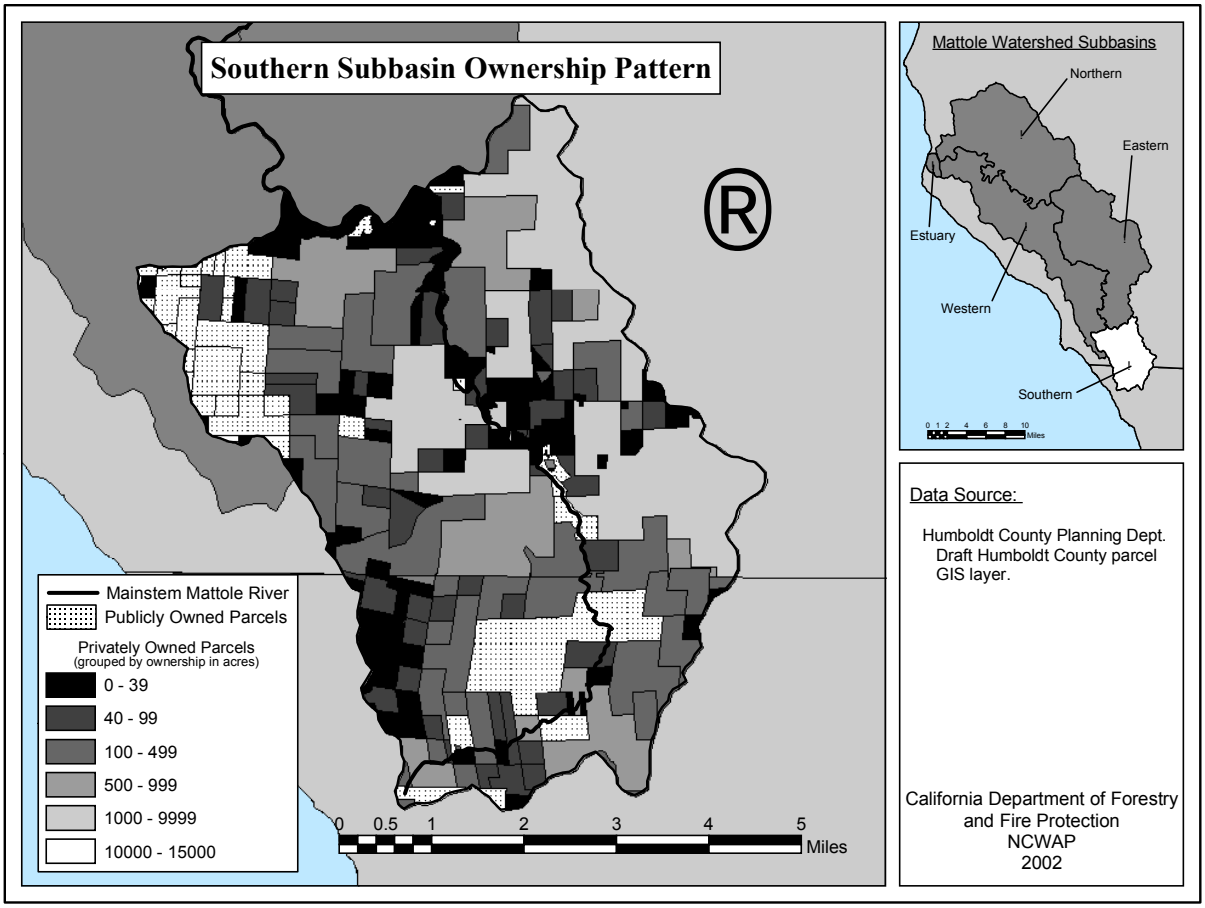


Figure 40: Ownership Pattern of the Southern Subbasin.

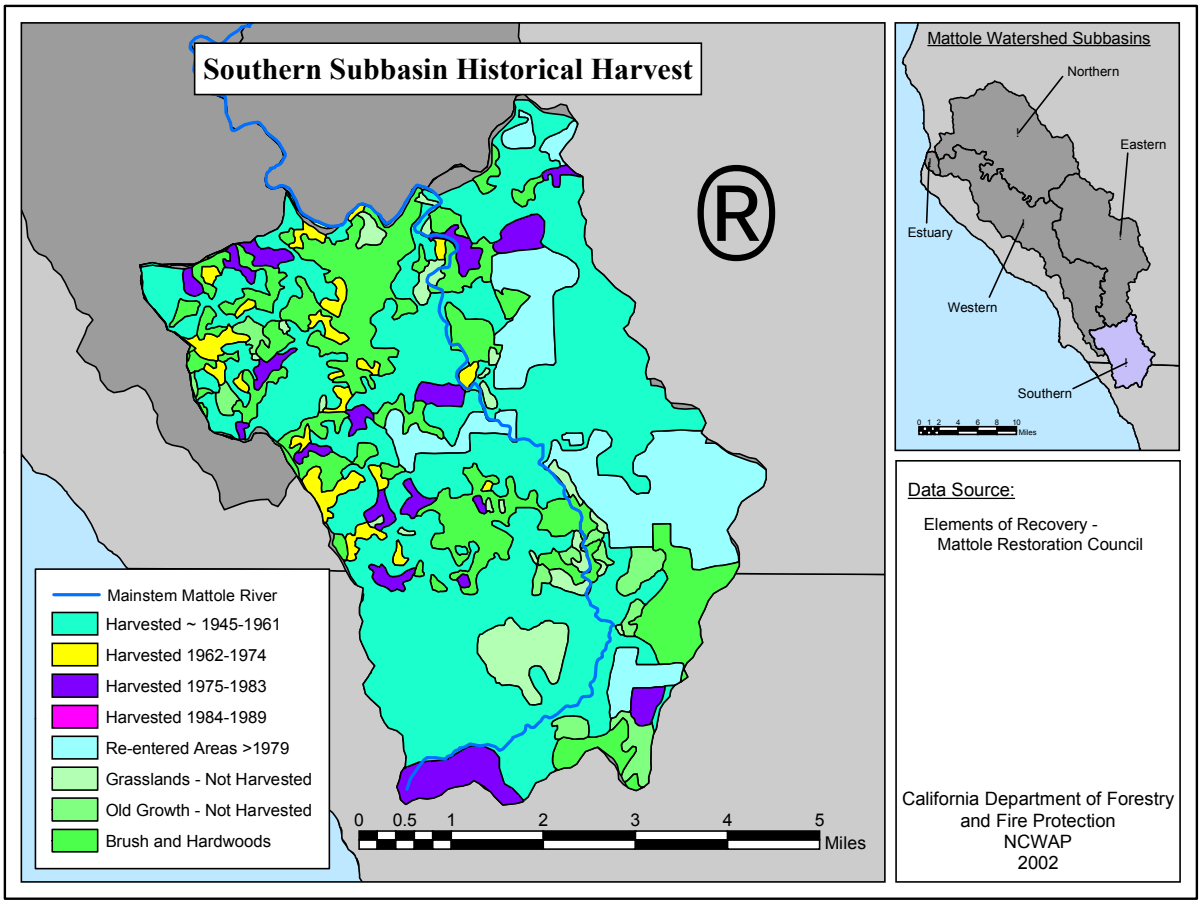


Figure 41: Timber Harvest History of the Southern Subbasin.

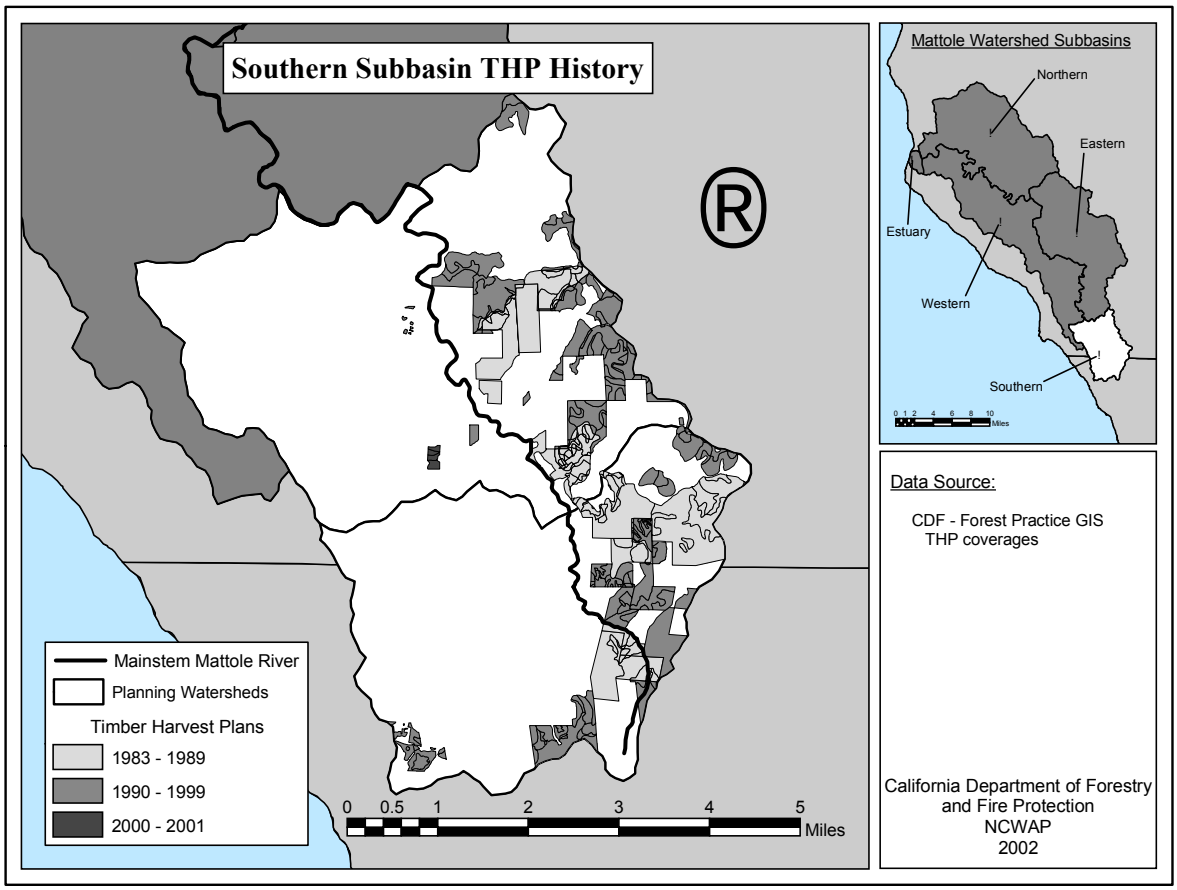


Figure 42: Timber Harvest Plans (THPs) of the Southern Subbasin.

Timber harvesting covered a substantial portion of the basin prior to the 1964 flood. The logging method was tractor logging down to streamside road systems. The silviculture was a type of seed tree cut that often left brush and some conifer. The resulting effects are still present. Timber harvesting activity since 1983 has covered about 21% of the subbasin, the highest level of harvesting in the Mattole Watershed. Both planning watersheds have had harvesting concentrated on the east side of the Mattole River. The silvicultural systems appear to be based on the uneven nature of the stands that were left after the first entries and primarily consist of even-aged regeneration methods, often using a rehabilation or alternative prescription. Since 1983, cable systems account for half of the logging operations used.

Table 29: Timber Harvest History, Southern Mattole Subbasin.

TIMBER HARVEST HISTORY - SOUTHERN MATTOLE SUBBASIN		
	Total Acres	Percent of Area
Harvested 1945-1961	8,875	50%
Harvested 1962-1974	546	3
Harvested 1975-1983	1,333	8
Harvested 1984-1989	1,519	9
Harvested 1990-1999	1,945	11
Harvested 2000-2001 (partial)	240	1

Fluvial Geomorphology

The fluvial geomorphology of the Southern subbasin is characterized by the lowest percentage of mapped channel characteristics and gullies, with corresponding low to intermediate values for lateral bar development. Two Planning Watersheds (PWs) make up the Southern subbasin; Bridge Creek and Thompson Creek. Table 31 illustrates the range in mapped channel characteristics, gullies, and lateral bar development from the 1984 and 2000 aerial photographs. In general, values for mapped channel characteristics are less than 10 percent of the overall channel length, gullies less than 5 percent of the overall containing area, and lateral bar development values are low within subreach lengths.

Table 30: Fluvial Geomorphic Features - Southern Mattole Subbasin.

	2000 Photos			1984 Photos		
Planning Watersheds	% Disturbed Channel [1]	% Gullies [2]	Lateral Bar Development [3]	% Disturbed Channel [1]	% Gullies [2]	Lateral Bar Development [3]
Bridge Creek	<10	<2	1	10-40	<2	1
Thompson Creek	<2	<2	1	<5	<2	1

All values are visual approximations at this stage and subject to change as GIS data becomes available.

[1] Features include: lack of riparian vegetation, distribution and number of lateral or mid-channel bars, multi-thread channels, cut-off chutes, channel bank erosion, and shallow landslides adjacent to or blocking channels.

[2] Gullies include those that appear active, have little to no vegetation within the incised area, and are of sufficient size to be identified on aerial photos.

[3] Lateral bars include mappable lateral, mid-channel bars and reflect sediment supply and storage. Rankings range from 1-5. Higher values suggest excess sediment

The Southern subbasin is the smallest in the Mattole Watershed. The Thompson Creek PW has low values and has shown no significant change from 1984 to 2000. The Bridge Creek PW has shown a significant decrease in disturbed channel during this same period, with no change in gullies or lateral bar development. Stream bank erosion in the Southern subbasin does not appear to be significant when compared with the other subbasins.

Table 31: Eroding Stream Bank Lengths - Southern Subbasin Planning Watersheds.

Southern Subbasin Planning Watersheds	*2000 Photos*			
	Number of Sites w/in PW	Maximum Length (m) of Eroding Bank w/in PW	Total Length (m) of Eroding Bank w/in PW	Approx. % Eroding Bank to Stream Length w/in PW
Bridge Creek	0	N.O.	N.O.	N.O.
Thompson Creek	0	N.O.	N.O.	N.O.

N.O.- Not Observed

Aquatic/Riparian Conditions

Unless otherwise noted, the vegetation description in this section is based on manipulation of Calveg 2000 data. This is vegetation data interpreted from satellite imagery by the United States Forest Service, Remote Sensing Lab. The minimum mapping size is 2.5 acres.

Vegetation within 150 feet of the centerline of streams is 79% mixed conifer and hardwood forest, 12% hardwood, and 7% conifer forest, while annual grassland, shrubs and barren combined make up the remaining 2%. The Mattole River is at its headwaters here and is narrow enough to receive full shade across its width from riparian vegetation. Sixty-six percent of the riparian area is covered by trees in the 12 to 23.5 inch diameter size class. The area occupied by this single-width zone is 14% of the total Southern Subbasin acreage.

Fish Habitat Relationship

The subbasin supports populations of chinook and coho salmon, and steelhead. In 2001, the DFG coho project snorkel surveys found coho salmon in one subbasin tributary. In recent years, the DFG Restoration Program has found coho in five other tributaries and the mainstem. Most tributaries support strong, multi-year class juvenile steelhead rearing populations based upon recent DFG stream surveys. Nearly all tributaries have favorable summer water temperatures for summer rearing habitat. This is one of the most important spawning reaches for all salmonids in the Mattole system. The Mattole Salmon Group has operated cooperative hatcheries with the DFG since 1981 in the Mattole, and much of that effort has been located in this area. The Mattole Salmon Group traps native chinook and coho, and has released over 400,000 fingerlings and yearlings during the period of operation.

Fish History and Status

Historically, the Southern Subbasin supported runs of chinook salmon, coho salmon, and steelhead trout. Interviews with local residents indicate that Vanauken Creek and Baker Creek were important salmon producing streams (Coastal Headwaters Association 1982). DFG stream surveys in the 1960s found steelhead trout in five streams, unidentified salmonids in two streams, and coho salmon in Upper Mill Creek. Moderate densities of steelhead trout were estimated for Baker Creek (100 per 100 feet of stream) in August 1966.

A study of the standing stock of Mattole Basin salmonids conducted in July and August 1972 (Brown, 1973b) examined five streams and seven stations on the mainstem Mattole River in the Southern Subbasin. Coho salmon were found in Harris Creek, Baker Creek, Thompson Creek, and the Mattole River one mile upstream from Baker Creek. Steelhead trout densities of over 100 fish per 100 feet of stream were found in Vanauken Creek, the Mattole River 100 yards downstream from Bridge Creek, and the Mattole River 0.5 miles upstream from Thompson Creek.

BLM, Coastal Headwaters Association, MSG, and DFG stream surveys have continued to document the presence of steelhead trout in most streams in the Southern Subbasin. A BLM survey of Anderson Creek in 1977 found juvenile steelhead trout. Coastal Headwaters Association surveys in 1981 and 1982 found steelhead trout in Bridge Creek, Upper Mill Creek, Harris Creek, Gibson Creek, Stanley Creek, Baker Creek, and Thompson Creek. MSG carcass surveys found steelhead trout in Thompson Creek in December 2000 and January 2001. DFG surveys found steelhead trout in Bridge Creek, Vanauken Creek, and Baker Creek in the 1980s and nine streams in the 1990s.

Unidentified salmonids were found in Bridge Creek in July 1972 and Baker Creek in July 1977 by BLM. These could have been coho salmon. In addition, coho salmon were detected in Bridge Creek, Anderson Creek, Thompson Creek, Yew Creek, and Stanley Creek in 1990s DFG stream surveys and in Yew Creek in 1995 by the Redwood Sciences Lab. MSG carcass surveys found coho salmon in

Baker Creek, Thompson Creek, Danny's Creek, and Yew Creek in the late 1990s and early 2000s. DFG electrofishing in the 1990s also found coho salmon in Baker Creek, Thompson Creek, and Yew Creek. A 1997-99 Redwood Sciences Laboratory study of juvenile coho salmon distributions in relation to water temperatures in the Mattole Basin (Welsh et al. 2001) found coho salmon in Baker Creek, Lost Man Creek, the headwaters of the Mattole River, Yew Creek, Thompson Creek, and Bridge Creek The 2001 DFG Coho Inventory found coho salmon in Upper Mill Creek, Baker Creek, Thompson Creek, Yew Creek, and the upper mainstem Mattole River.

This subbasin has the highest fish productivity in the Mattole Basin. The Mattole Salmon Group has operated cooperative hatcheries with the DFG since 1981 in the Mattole, and much of that effort has been located in the Southern Subbasin. The Mattole Salmon Group traps native chinook and coho, and has released 338,000 chinook salmon and 52,550 coho salmon fingerlings and yearlings during the period of operation. More detailed summaries of stream surveys and fisheries studies in the Southern Subbasin are provided in the DFG Appendix.

Fish Passage Barriers

Six stream crossings were surveyed in the Southern Subbasin as a part of the Humboldt and Mendocino County culvert inventories and fish passage evaluations conducted by Ross Taylor and Associates (2000, 2001). Briceland Road has a culvert on Ancestor Creek, and Whitethorn Road has culverts on Baker Creek, Gibson Creek, Harris Creek, Ravasoni Creek (East Anderson Creek), and Stanley Creek. The culvert on Ancestor Creek was found to be a total salmonid barrier and the culverts on Gibson Creek, Harris Creek and Stanley Creek were found to be partial salmonid barriers (Table 32: *Taylor, 2000; G. Flosi, personal communication).* The culvert on Ravasoni Creek (East Anderson Creek) was found to be a temporary and partial salmonid barrier while the culvert on Baker Creek was not found to be a salmonid barrier. In fact, the culvert in Baker Creek was thought to be the best road crossing observed in Humboldt County in the course of the inventory.

Priority ranking of 26 culverts in Mendocino County for treatment to provide unimpeded salmonid passage to spawning and rearing habitat placed the culvert on Ancestor Creek at rank 3. In a similar list of priority rankings for 67 culverts in Humboldt County, rankings of culverts in the Southern Subbasin ranged from 15 for Stanley Creek to 43 for Baker Creek. Criteria for priority ranking included salmonid species diversity, extent of barrier present, risk of culvert failure, current culvert condition, salmonid habitat quantity, salmonid habitat quality, and a total salmonid habitat score. The culvert on Ravasoni Creek (East Anderson Creek) is scheduled for improvements in 2002 while the culverts on Gibson Creek and Stanley Creek were proposed but not funded at this time for improvement (G. Flosi, personal communication).

Table 32: Culverts Surveyed for Barrier Status in the Southern Subbasin.

Stream Name	*Road Name*	*Priority Rank*	*Barrier Status*	*Upstream Habitat*	*Treatment*
Ancestor Creek	Briceland Road	3	Total barrier. A barrier for adult coho and steelhead and all age classes of juveniles.	2.0 miles of good salmonid habitat.	None proposed at this time
Baker Creek	Whitethorn Road	43	Not a barrier. Short of a bridge this was the BEST crossing observed in Humboldt County.	Approximately 1.6 miles of good salmonid habitat.	None proposed at this time
Gibson Creek	Whitethorn Road	19	Partial barrier. The culvert is nearly a complete barrier for adults and a complete barrier to juveniles. An excessive jump (4.9 ft at low flow) is required to enter culvert. Velocities are also excessive due to steep slope and length of pipe.	1.0 to 1.7 miles of potential salmonid habitat.	Proposed but not funded for improvement
Harris Creek	Whitethorn Road	40	Partial barrier. The culvert is not a barrier for adults and a partial barrier to juveniles. For juveniles, an excessive jump is required to enter the culvert.	0.75 to 1.75 miles of potential salmonid habitat.	None proposed at this time
Ravasoni Creek (East	Whitethorn Road	20	Temporary and partial barrier. The culvert is a temporary barrier for adults (20-40% passable for coho and 60-80% passable for steelhead) and a total barrier to juveniles.	1.1 miles of potential salmonid habitat.	Funded and scheduled for improvement in

Stream Name	*Road Name*	*Priority Rank*	*Barrier Status*	*Upstream Habitat*	*Treatment*
Anderson Creek)			An excessive jump is required to enter the culvert, even for adults. Excessive velocity is caused by steep slope (at inlet, steeper slope along first 20 ft).		2002
Stanley Creek	Whitethorn Road	15	Partial barrier. The culvert is probably not a barrier for adults, but a complete barrier to juveniles. For juveniles, an excessive jump is required to enter culvert. Leakage through rusted bottom may be harmful to out-migrating juveniles. Steelhead observed above the culvert, however, coho were only seen below the culvert.	Approximately 1.7 miles of potential salmonid habitat.	Proposed but not funded for improvement

Habitat Summary

The Southern Subbasin EMDS evaluations were determined by calculating a mean, area weighted watershed condition value from the Bridge Creek and Thompson Creek Calwater 2.2 Units. The evaluation results of each subbasin are presented in the EMDS section of the Mattole River Watershed Profile. The overall condition of the Calwater 2.2 Units were determined by the results of the following level one network factors:

- Passage Barriers (currently with no data in this subbasin)
- Upland Condition
- Road Condition
- Stream Condition

Evaluating the suitability of each of these four watershed condition factors that affect salmon and steelhead provides the degree of subbasin suitability for the fish. The condition of each of these factors, in turn, is determined by evaluating the suitability of the many watershed condition variables that affects it. In all, there are four nested tier levels in the EMDS suitability analysis system. The EMDS system is not predictive, but rather functions as a dynamic filing system to isolate and evaluate the many detailed variables operating in a watershed. These variables are combined in the system much like they interact in the watershed itself.

Each individual variable at level four, the deepest tier, is assigned an evaluation rating between –1 (fully unsuitable) and +1 (fully suitable) compared to known standards that produce conditions that are either good or bad for salmonids. These condition values are passed up through the network according to their power to develop, restrict, or over-ride conditions affecting fish population health. For example, water is the most restrictive variable for fish. Regardless of suitable conditions for other factors like shade canopy, clean gravel, large woody debris, and pool depth, a lack of water over-rides those good conditions and makes the overall result unsuitable for fish. The arrangement of the factors in the system and the way they are combined allows this sort of variable interaction. This functional model provides analysts the capacity for orderly assessment of the watershed's condition. (Figure 5, pg. 43). Network details are described in Appendix **A** and maps showing EMDS results are provided in Appendix **B**.

The system can be structured to operate with watersheds of various scales from basin level to stream reaches. NCWAP operated the system at the basin, subbasin, Calwater planning watershed, and stream reach scales. Regardless of scale or the ultimate suitability rating an assessment produces, the system allows for backtracking to find the factors that have affected the suitability rating. As such, the system is useful for the identification of watershed improvement opportunities. It is also good at identifying areas of refugia and resources that need protective measures during land use activities.

The system evaluates conditions at a particular moment in time and is static in its analysis. However, it also can be useful for recording changes in watershed factor conditions as discovered through new

field assessments or a series of monitoring activities. Changes in suitability of conditions for fish due to both natural processes and restoration efforts can be evaluated in this fashion. Multiple system "runs" over time can therefore document change and be useful for trend analysis. Thus, the ultimate "suitability" ratings are somewhat secondary in importance to the utility of the system for detailed watershed factor condition assessment, diagnostics, and development of recommendations for watershed improvement activities.

The overall watershed condition rating from the EMDS model was somewhat unsuitable for the Southern Subbasin. Watershed conditions in the two Calwater Units were somewhat unsuitable.

Data on fish passage barriers has not yet been incorporated into EMDS. However, this data is presented in the Fish Passage Barriers section of the Southern Subbasin Overview. A culvert on Ancestor Creek was found to be a total salmonid barrier and culverts on Gibson Creek, Harris Creek and Stanley Creek were found to be partial salmonid barriers (Table 32). A culvert on Ravasoni Creek (East Anderson Creek) was found to be a temporary and partial salmonid barrier while a culvert on Baker Creek was not found to be a salmonid barrier. Ancestor Creek and Baker Creek are in the Thompson Creek Calwater Unit and Gibson Creek, Harris Creek, Stanley Creek, and Ravasoni Creek are in the Bridge Creek Calwater Unit (Table 33).

Upland condition in the Southern Subbasin was rated somewhat unsuitable by EMDS. Both Calwater Units in the subbasin had somewhat unsuitable upland conditions. Fully suitable ratings for early seral and moderately suitable ratings for slope stability were balanced by fully unsuitable ratings for upland cover and canopy. Land use was somewhat unsuitable.

Road condition in the Southern Subbasin was rated somewhat unsuitable by EMDS. Road condition ratings were somewhat unsuitable in both Calwater Units. Road use was undetermined in both Calwater Units while ratings for stream crossings, road density by hillslope position, and road proximity were fully suitable. On the other hand, road density unstable ratings were fully suitable.

Stream condition in the Southern Subbasin was rated somewhat unsuitable by EMDS. Data on water temperature and stream flow have not yet been incorporated into EMDS. However, water temperature data is presented in the North Coast Water Quality Control Board Appendix and stream flow data is presented in the Department of Water Resources Appendix and in individual stream survey report summaries (Appendix X). Temperatures were collected in Bridge Creek and Vanauken Creek which are in the Bridge Creek Calwater Unit; and Baker Creek, Yew Creek, Thompson Creek, Helen Barnum Creek, Lost Man Creek, Dream Stream, and Ancestor Creek which are in the Thompson Creek Calwater Unit. The lower temperatures in Bridge Creek, Vanauken Creek, Baker Creek, Yew Creek, Thompson Creek, Helen Barnum Creek, Lost Man Creek, Dream Stream, and Ancestor Creek are within the 50-60^{o} F range suitable for coho salmon viability, although a number of the MWATs are right at the upper temperature threshold of 60 ^{o}F. Riparian ratings were somewhat suitable in the Thompson Creek Calwater Unit and moderately unsuitable in the Bridge Creek Calwater Unit. Reach condition was somewhat unsuitable in both Calwater Units.

In the Mattole Basin, the Ecological Management Decision Support system (EMDS) evaluated four main condition factors:

Passage Barriers,

Upland Condition,

Road Condition,

and **Stream Condition**. Of these, Upland, Road, and Stream Condition values are products of several condition factors, which are also listed in Table X. Finally, all four main factors are combined to produce an **Overall Watershed Condition** value. Please refer to a detailed explanation of EMDS on page 37.

Key:

+++	Fully suitable
++	Moderately suitable
+	Somewhat suitable
U	Undetermined
-	Somewhat unsuitable
--	Moderately unsuitable
---	Fully unsuitable

Table 33: EMDS Watershed Suitability Ratings for the Southern Subbasin by CalWater 2.2 Unit.

Condition Factor \ Watershed Unit	Southern Subbasin	Bridge Creek	Thompson Creek
Passage Barriers	**U**	**U**	**U**
Upland Cover	**- - -**	**- - -**	**- - -**
Canopy	**- - -**	**- - -**	**- - -**
Early Seral	**+++**	**+++**	**+++**
Slope Stability	**++**	**++**	**++**
Land Use	**-**	**-**	**-**
Upland Condition	**-**	**-**	**-**
Road Use	**-**	**U**	**U**
Stream Crossings	**- - -**	**- - -**	**- - -**
Road Density By Hillslope Position	**- - -**	**- - -**	**- - -**
Road Density Unstable	**+++**	**+++**	**+++**
Road Proximity	**- - -**	**- - -**	**- - -**
Road Condition	**-**	**-**	**-**
Water Temperature	**U**	**U**	**U**
Stream Flow	**U**	**U**	**U**
Riparian	**-**	**- -**	**+**
Reach Condition	**-**	**-**	**-**
Stream Condition	**-**	**- -**	**-**
Overall Watershed Condition	**-**	**-**	**-**

Reach condition was assessed by EMDS using stream attributes such as canopy cover, embeddedness, percent pools, pool depth, and pool shelter. These attributes were collected in 12 streams in the Southern Subbasin by DFG (see Appendix X for stream survey report summaries). Bridge Creek, SB WF Bridge Creek, Vanauken Creek, Anderson Creek, and Stanley Creek are in the Bridge Creek Calwater Unit. Baker Creek, Thompson Creek, Yew Creek, Helen Barnum Creek, and Lost Man reek are in the Thompson Creek Calwater Unit. The Mattole Headwaters flow through both the Bridge Creek and Thompson Creek Calwater Units.

Stream attributes tend to vary with stream size. For example, larger streams generally have more open canopy and deeper pools than small streams. This is partially a function of wider stream channels and greater stream energy due to higher discharge during storms. Surveyed streams in the Southern Subbasin ranged in drainage area from 0.7 to 12.8 square miles (Figure 43).

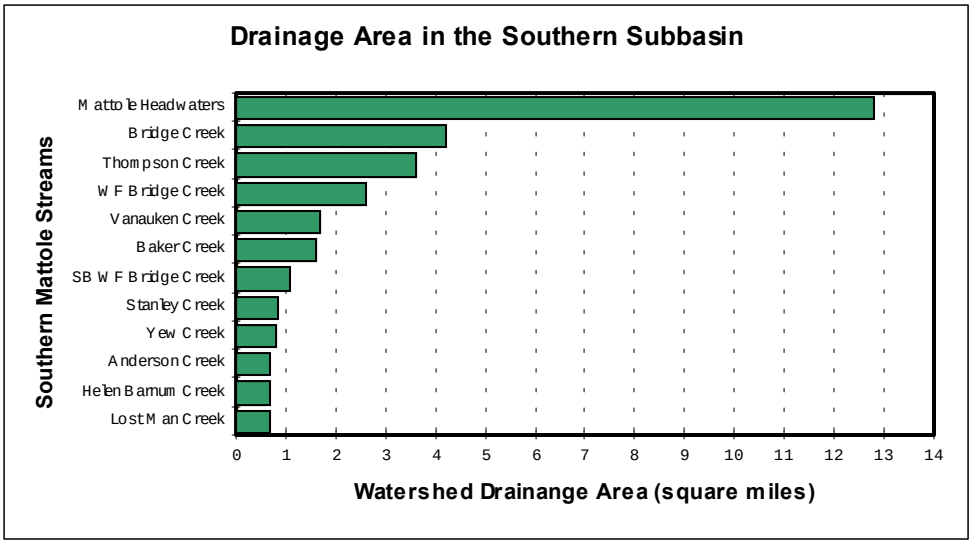


Figure 43: Drainage Area of Stream Surveyed by DFG in the Southern Subbasin.

Canopy cover, and relative canopy cover by coniferous versus deciduous trees were measured at each habitat unit during DFG stream surveys. Near-stream forest density and composition contribute to microclimate conditions that help regulate air temperature, which is an important factor in determining stream water temperature. Furthermore, canopy levels provide an indication of the potential present and future recruitment of large woody debris to the stream channel, as well as the insulating capacity of the stream and riparian areas during winter.

In general, the percentage of stream canopy cover increases as drainage area, and therefore channel width, decrease. Deviations from this trend in canopy may indicate streams with more suitable or unsuitable canopy relative to other streams of that subbasin. As described in the EMDS response curves, total canopy (sum of conifer and deciduous canopy) exceeding 85% is considered fully suitable, and total canopy less than 50% is fully unsuitable for contributing to cool water temperatures that support salmonids. The surveyed streams of the Southern Subbasin show percent canopy levels that are rated by the EMDS as fully suitable to somewhat unsuitable for maintaining cool water temperatures yet are generally the highest among the subbasins (Figure 44). Percent conifer canopy levels vary from 5% to 31%.

Cobble embeddedness was measured at each pool tail crest during DFG stream surveys. Cobble embeddedness is the percentage of an average sized cobble piece at a pool tail out that is embedded in fine substrate. Category 1 is 0-25% embedded, Category 2 is 26-50% embedded, 51-75% Category 3

is embedded, Category 4 is 76-100% embedded, and Category 5 is unsuitable for spawning due to factors other than embeddedness. Cobble embedded deeper that 51% is not within the fully supported range for successful use by salmonids. The EMDS Reach Model considers cobble embeddedness greater than 50% to be somewhat unsuitable and 100% to be fully unsuitable for the survival of salmonid eggs and embryos. Embeddedness values in the Southern Subbasin yield EMDS ratings that vary from somewhat suitable to fully unsuitable for the survival of developing salmonid eggs and embryos (Figure 45). However, Figure 45 also illustrates how stream reaches rated as unsuitable overall may actually have some suitable spawning gravel sites distributed through the stream reach.

Pool, flatwater, and riffle habitat units observed were measured, described, and recorded during DFG stream surveys. During their life history, salmonids require access to all of these types of habitat. EMDS does not evaluate the ratio of these habitat types, but a balanced proportion is desirable. Most surveyed Southern Subbasin tributaries have 20%-30% pool habitat by length, but five streams have less than 20% pool habitat and five have greater than 30% pool (Figure 46). Dry units were also measured, and obviously indicate poor conditions for fish.

Pool depths were measured during DFG surveys. The amount of primary pool habitat of sufficient depth to be fully suitable for anadromous salmonids is considered in the EMDS Reach Model. Primary pools are determined by a range of pool depths, depending on the order (size) of the stream. Generally, a reach must have 30 – 55% of its length in primary pools for its stream class to be in the suitable ranges (EMDS Table 4). Generally, larger streams have deeper pools. Deviations from the expected trend in pool depth may indicate streams with more suitable or unsuitable pool depth conditions relative to other streams of that subbasin. Most pools in Southern Subbasin streams are relatively shallow, but that the Mattole Headwaters and Stanley Creek stand out as streams with relatively abundant deep pools for their size (Figure 47). The EMDS Reach Model rates several streams as fully suitable and others as fully unsuitable with regard to pool habitat.

Pool shelter was measured during DFG surveys. Pool shelter rating illustrates relative pool complexity, another component of pool quality. Ratings range from 0-300. The Stream Reach EMDS model evaluates pool shelter to be fully unsuitable if less than a rating of 30. The range from 100 to 300 is fully suitable. Pool shelter ratings in the Southern Subbasin are among the highest in the Mattole basin, but only the Mattole Headwaters scored above 80 to suggest fully suitable pool habitat complexity and cover (Figure 48).

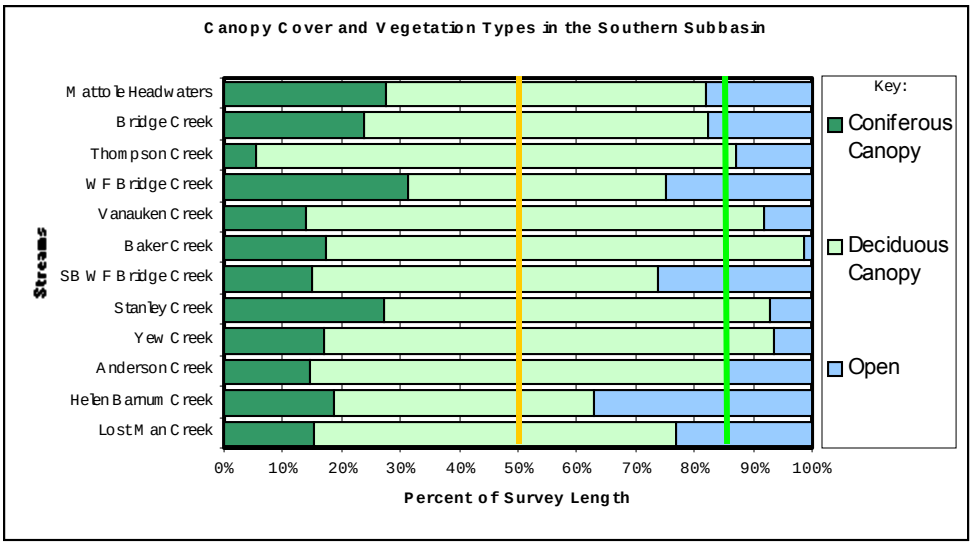


Figure 44: The Relative Percentage of Coniferous, Deciduous, and Open Canopy Covering Surveyed Streams, Southern Subbasin.

Averages are weighted by unit length to give the most accurate representation of the percent of a stream under each type of canopy. Streams are listed in descending order by drainage area (largest at the top). As described in the EMDS response curves, total canopy (sum of conifer and deciduous canopy) exceeding 85% (green line) is considered fully suitable, and total canopy less than 50% (yellow line) is fully unsuitable for contributing to cool water temperatures that support salmonids.

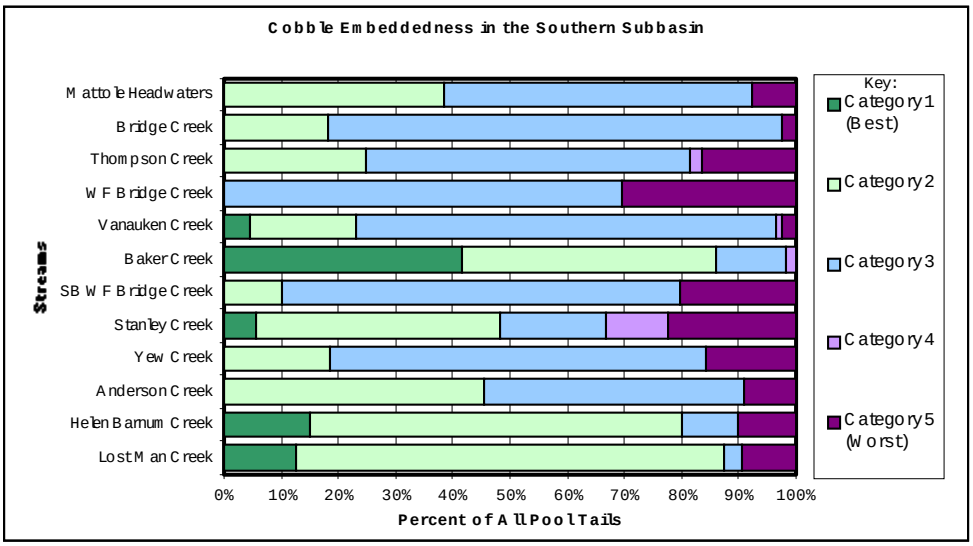


Figure 45: Cobble Embeddedness Categories as Measured at Every Pool Tail Crest in Surveyed Streams, Southern Subbasin.

Cobble embeddedness is the % of an average sized cobble piece at a pool tail out that is embedded in fine substrate: Category 1 = 0-25% embedded, Category 2 = 26-50% embedded, Category 3 = 51-75% embedded, Category 4 = 76-100%, and Category 5 = unsuitable for spawning due to factors other than embeddedness (e.g. log, rocks). Substrate embeddedness Categories 3, 4, and 5 are considered by EMDS to be somewhat unsuitable to fully unsuitable for the survival of salmonid eggs and embryos. Streams are listed in descending order by drainage area (largest at the top).

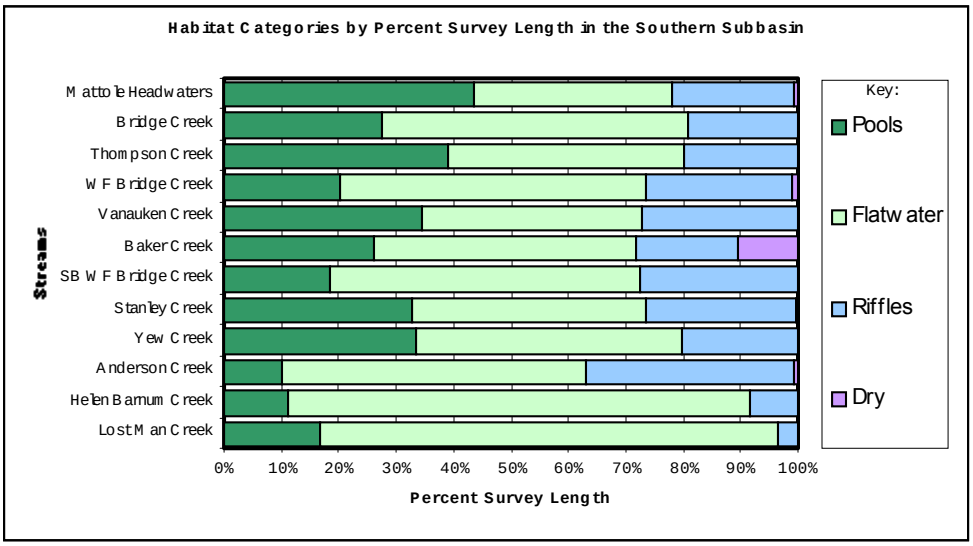


Figure 46: The Percentage of Pool Habitat, Flatwater Habitat, Riffle Habitat, and Dewatered Channel by Survey Length, Southern Subbasin.

EMDS does not evaluate the ratio of these habitat types, but a balanced proportion is desirable. Streams are listed in descending order by drainage area (largest at the top).

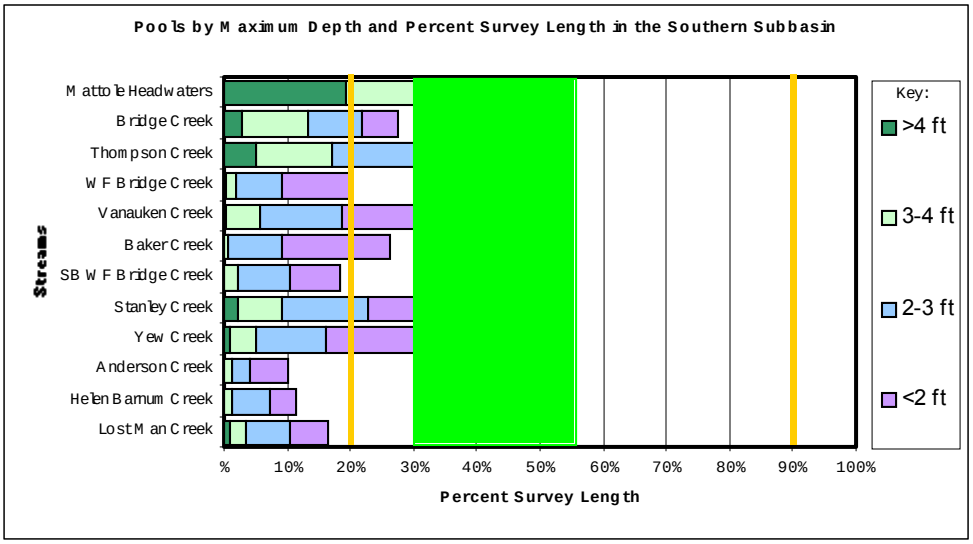


Figure 47: Percent Length of a Survey Composed of Deeper, High Quality Pools, Southern Subbasin.

Values sum to the length of percent pool habitat in Figure 46. As described in the EMDS response curves, a stream must have 30-55% (green area) of its length in primary pools to provide stream conditions that are fully suitable for salmonids. Streams with <20 % or >90% (yellow lines) of their length in primary pools provide conditions that are fully unsuitable for salmonids. Streams are listed in descending order by drainage area (largest at the top).

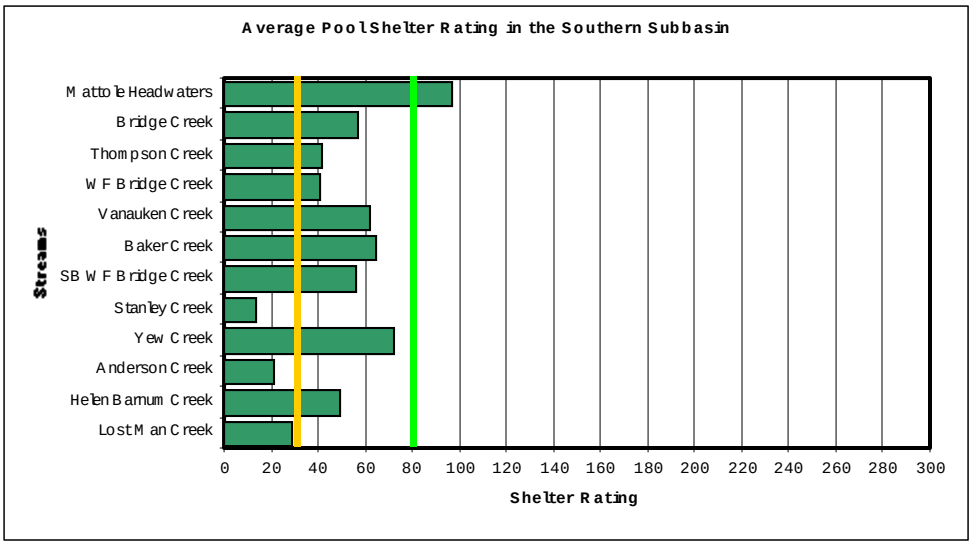


Figure 48: Average Pool Shelter Ratings from DFG Stream Surveys, Southern Subbasin.

As described in the EMDS response curves, average pool shelter ratings exceeding 80 (green line) are considered fully suitable and average pool shelter ratings less than 30% (yellow line) are fully unsuitable for contributing to shelter that supports salmonids. Streams are listed in descending order by drainage area (largest at the top).

Subbasin Trends

The trends for several factors within the Mattole River tributaries in the Southern subbasin can be summarized as follows. The size and density of the riparian zone woody vegetation in privately owned timberlands will increase over time due to timber harvesting plan regulations. Those timberlands owned by the public are withdrawn from management activities and the size and density of the riparian zone woody vegetation is also expected to increase over time. Humboldt County requires new construction set-backs from watercourses that will help preserve existing riparian vegetation, but the clearing of vegetation by landowners as part of rural residential living is not regulated. Mendocino County does not require building set-backs adjacent to streams, but does refer permit applications that the County finds may have environmental concerns to the California Department of Fish and Game. Both counties have additional regulations associated with flood plains and the Coastal Zone. Trends for riparian zones bordered by or containing roads are also unclear. It is possible that some roads may be abandoned and riparian vegetation re-established, but many of the roads are County roads, lead to streamside County roads or access rural residential parcels. Riparian vegetation may be sacrificed in road maintenance activities, both regular and storm induced.

The number of roads within the watershed can be expected to increase as timberlands are harvested for the first time since the application of Forest Practice rules. These rules and current practices generally require road systems located high on the slope unlike earlier timber harvest and transportation systems that established roads low on the slopes, often near streams. Lands recently purchased for the Gilham Butte reserve that will be in Bureau of Land Management (BLM) ownership and management when transactions are complete will have road assessment and inventory evaluation as part of a change in landowner objectives.

The short time period of stream temperature data results and for D50 values, an indicator of fine sediment in the streambed does not allow for any trend analysis. There is no data on suspended sediment.

Relative disturbed stream channel percentages and stream bank erosion during the time period of 1984 to 2000 appeared to be lowest in this subbasin. Analysis of previous years has not been undertaken to see if this is a continuing trend. Both the 1955 and 1964 floods were one hundred year return events while all other major storm events in the years 1951-2000, the period of record for the Petrolia stream gauge, hover around the ten year flood event level.

Current estimated populations of chinook salmon and coho salmon throughout the Mattole Basin are low compared to United States Fish and Wildlife Service (USFWS) estimated populations in 1960. Outmigrant trapping of steelhead trout appears to indicate that their population is closer to the 1960 USFWS population estimate. However, not enough quantitative data on any salmonid species exists to establish clear trends on a subbasin basis.

Southern Subbasin Issues

- The use of herbicides on industrial timberlands is of concern for both human health and water quality reasons. The impacts of these applications have not been quantified in this subbasin. Further study of this issue would be recommended.

- There is a higher risk of catastrophic fire in this subbasin due to the high density of human inhabitance in proximity to wild lands.

- Limited road assessment and treatment has been completed in this subbasin. These efforts should be expanded because of the potential for further sediment delivery from active and abandoned roads, many of which are in close proximity to stream channels.

- This subbasin has been disportionately impacted by road density and location, human habitation, human waste disposal, and land disturbance from building of structures, land modification, and water usage and drainage.

- Excessive extraction of water from springs, tributaries, and the mainstem during summer low flow periods is detrimental to fish survival, particularly in drought years.

- Recent instream sediment sampling data indicates that there are continuing inputs of fine sediments, but this does not appear to be a major limiting factor for salmonid production.

- The geology of the Southern subbasin is the most uniform and is more resistant to erosion and slope instability with the largest continuous areas of hard terrain and lowest landslide density in comparison to the other subbasins in the Mattole watershed (CGS, 2000).

- Most of the active mass wasting activity appears to be in the form of debris slides, and the majority of these are observed adjacent to streams, or in association with roads. The occasional larger dormant landslides are scattered widely throughout the subbasin (CGS, 2000).

- Debris slide slopes are extensive throughout the steep hard terrain (CGS, 2000).

- Portions of the subbasin underlain by active landslides are interpreted as having a very high landslide potential. Areas underlain by moderate to steep slopes are generally interpreted as having a moderate to high landslide potential (CGS, 2000).

- The Bridge Creek PW has shown a significant decrease in negative channel characteristics during this same period, with no change in gullies or lateral bar development. The Thompson Creek PW has low values and has shown no significant change from 1984 to 2000 (CGS, 2000).

- Stream bank erosion in the Southern subbasin does not appear to be significant compared with the other subbasins (CGS, 2000).

- Suitable water temperatures in most streams reflect adequate canopy shade for summer rearing of juvenile salmonids. The best remaining habitat in the Mattole basin is found in this area. This translates to the highest fish productivity rate in the Mattole basin.

- Very high loading of instream of large woody debris has been enhanced by restoration projects since 1996. Future natural recruitment potential for large woody debris is higher in this area because substantial riparian areas along the mainstem are devoted to conservation purposes.

- The DFG (2002) has conducted analyses on macroinvertebrate data collected by the BLM since 1996 on six subbasin streams. The results show the samples were either fair to good, or good in terms of overall conditions. Additional data for aquatic macroinvertebrate productivity would be useful for effectiveness monitoring purposes.

- There is no available data on pH, dissolved oxygen, nutrients, and other water chemistry parameters.

- Removal of in-stream large woody debris under direction of the DFG occurred in about twenty-one miles of streams in this subbasin during the 1980's. A total of 36,800 cubic feet of wood was removed. This is equivalent to 294 logs 2 feet x 40 feet. This activity likely had adverse local impacts on salmonid habitat conditions. Beginning in 1996, a series of DFG funded instream enhancing projects completed by the Mattole Salmon Group have restored much of the complexity by the addition of large woody debris to key stream reaches.

- Wildlife/Plants -- Inadequate information exists to assess the status and trends of flora and fauna, including invasive species.

- Opportunities for public recreation in this area are available but limited to public lands.

- A major salmonid rearing facility exists in the headwaters, operated since 1982 by the Mattole Salmon Group. This operation has been successful and should be continued in order to supplement wild populations of chinook salmon.

- In order to protect privacy while developing data, the possibility of training local landowners to survey their own streams to conduct salmonid population status surveys would be advisable to help determine fish populations throughout this planning basin.

Southern Subbasin Issue Synthesis

Working Hypothesis 1*:*

WATERSHED AND STREAM CONDITIONS ARE THE MOST SUPPORTIVE OF SALMONIDS IN THE MATTOLE BASIN.

Supportive Findings:

- All three species of the Mattole Basin's anadromous salmonids are present in streams throughout this subbasin.

- In general, MWATs in the Southern subbasin are grouped in the high 50º F to low 60º F range. This is within the range suitable for salmonids.

- The DFG Coho Assessment Project found coho in three subbasin tributaries in 2001.

- V[DFG15]-Star (V*) was 0.04 in Bridge Creek in 2000, which is exceptionally low and may indicate low sediment production due to few, if any, upslope disturbances or rapid sediment transport through well armored pools that may experience high rates of scour during storms.

- The DFG has conducted analyses on macroinvertebrate data collected by BLM since 1996 on six subbasin streams. The results show the samples were either fair to good, or good in terms of overall conditions.

Contrary Finding:

- During the summer, the mainstem Mattole River channel in this subbasin has either intermittent flow or is dewatered above the confluence with Mill Creek.

Working Hypothesis 2:

SOME REACHES OF STREAMS IN THE SUBBASIN ARE NOT FULLY SUITABLE FOR SALMONIDS DUE TO STREAM FLOW REDUCTIONS RELATED TO HUMAN DIVERSION.

Supportive Findings:

- Data from the 2000 Census shows that Southern subbasin has the most concentrated human population in the Mattole Basin at 7.4 people per square mile and that most of them are concentrated along the upper Mattole River and its major tributaries.

- Field observations indicate that intermittent flow and dewatering of the mainstem Mattole headwaters area (above Whitethorn) occurs in dry years.

Recommendations:

1. Ensure that this high quality habitat is protected from degradation.

2. Encourage reducing the unnecessary and wasteful use of water to improve river flows and fish habitat.

3. Monitor summer water and air temperatures to detect trends using continuous 24 hour monitoring thermographs.

4. Encourage the monitoring of in-channel sediment and tracking of aggraded reaches in the lower basin by establishing monitoring stations and training personnel.

5. Encourage the use of cable or helicopter yarding on steep and unstable slopes to reduce soil compaction, surface disturbance and resultant sediment yield.

6. Continue efforts such as road assessment, improvements, and decommissioning throughout the basin to reduce sediment delivery to the Mattole River and its tributaries.